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26. FECUNDITY OF SOME HILL-STREAM FISHES OF GARHWAL HIMALAYA

INTRODUCTION

Studies on fish fecundity form an important aspect of fisheries science. The fecundity of hill-stream fishes of Garhwal Himalaya has not been studied extensively. Baloni (1979, 1980) studied fecundity of *Schizothorax richardsonii* and *Glyptothorax garhwali.*

The term fecundity as used in this paper is defined as the number of ripening eggs found in the ovaries prior to spawning. The reproductive capacity of a population is the function of the fecundity of females. There are inter- and intra-specific differences in fecundity of fishes; the higher or lower rate of fecundity depends on the length, weight and age of the fishes, the weight of the ovary and environmental factors.

MATERIALS AND METHODS

Ripe specimens were used for the study of fecundity of the fish. The number of mature ova with considerable amount of yolk deposition which were ready to be released, were taken for estimating fecundity. For each specimen the weight of the preserved ovaries was noted. A portion of the ovary was then weighed separately and all mature ova contained in the latter were counted, from which the total number of ova in the pair of ovaries was computed.

OBSERVATIONS

In Table 1, the average fecundity of fishes collected during this study is given. The fecundity depends more on the weight of the ovary than on the weight or length of fish.

DISCUSSION

Fecundity forms a very important subject for fisheries science and fish production. Older fish not only produce more eggs because of their large weight and size but also produce larger eggs, as fry resulting from large eggs have better chances of survival than fry hatched from smaller eggs.

Fecundity not only depends on the species of fish but also on environmental factors. Low water temperature affects fish growth by depressing the metabolic rate and reducing food conversion. A similar effect on growth results from inadequate food supply.

According to the present study, the fecundity of *Crossocheilus latius* in the size range 125 mm to 215 mm was ranged between 2420 and 4512. Information available on the fecundity of an allied species, *Crossocheilus diplocheilus* by Das & Singh (1969) and Malhotra & Jyoti (1974) revealed that the fecundity in size range 95 mm to 128 mm and 88 mm to 108 mm ranged from 8424 to 21432 and 1996 to 2780 respectively.

Das & Singh (op. cit.) reported that fecundity of *Labeo dero* in the size range 230 mm to 271 mm ranged between 45650 and 91188. Bhatnagar (1964) reported that the fecundity of *Labeo dero* in the size range 330 mm to 504 mm ranged between 67288 and 710934. In the present study in Garhwal region, the fecundity of *Labeo dero* in the size range 230 mm to 340 mm ranged between 52616 and 85182.

According to Baloni (1979) the fecundity of *Schizothorax richardsonii* in the size range 425 mm to 560 mm was found to be between 8465 and 14316. In the present study the fecundity of this species in the size range 190 mm to 560 mm ranges between 1578 and 14316. In other schizothorachids, such as *Schizothorax niger* (Jyoti & Malhotra 1972) the fecundity in the size range 123 mm to 365 mm ranged between 810 and 13940.

Chaturvedi (1976) observed that the fecundity of *Tor tor* in the size range 400 mm to 800 mm ranged between 49146 and 175886. According to the annual report of Central Inland Fisheries Research Institute, Barrackpore (1960-61), the fecundity of nine specimens in the size range 283 mm to 750 mm ranged between 7000 and 100000. In the prestudy, the fecundity of *Tor tor* in the size range 315 mm to 658 mm ranged between 8400 and 98882.

The fecundity of *Noemacheilus beavani, N. botia, N. montanus* and *N. rupicola* has not been studied earlier. In other cobitids, such as *Noemacheilus kashmiriensis,* according to Das & Singh (1969) and Malhotra & Jyoti (1974), the fecundity in the size range 68 mm to 112 mm and 90 mm to 104 mm was ranged between 3042 and 8290 and from 3600 to 4880 respectively. Malhotra & Jyoti (1974) estimated the fecundity of *Botia birdi* in the size range 88 mm to 119 mm to range between 875 and 10509. Rita Kumari & Balakrishnan Nair (1978) reported the fecundity of *Lepidocephalus thermalis* in the size range 45 mm to 62 mm to range between 4400 and 8200. The fecundity of these four cobitids under study here is less as compared to the fecundity of *Noemacheilus kashmiriensis, Botia birdi* and *Lepidocephalus thermalis.*

Baloni (1980) reported that the fecundity of *Glyptothorax garhwali* in the size range 145 mm to 156 mm ranged between 1138 and 3103. The present study reveals that the fecundity of this species with total length 140 mm to 156 mm ranged between 1025 and 3103. The fecundity of *Glyptothorax brevipinnis alaknandi, G. pectinopterus* and *Pseudecheneis sulcatus* is given in Table 1. The fecundity of none of the sisorid has yet been reported by other workers.

The highest fecundity is recorded in *Tor putitora, T. tor* and *Labeo dero.* But in nature, the juveniles of these species are found in much less numbers. The reason for the low survival rate of these fishes could be manyfold. (1) All the discharged ova do not get fertilised, when the male sheds the spermatic fluid over them. In fast flowing water, this is possible. (2) Sometimes the spawning grounds of these fishes are shallow and due to the heat of the sun and seepage of water, they dry up, killing all the fry and fingerlings.

TABLE 1

Name of species	Range of total length in mm.	Range of weight of fish in mg.	Range of weight of ovary in mg.	Range of total number of ova
Barilius bendelisis	112-140	9113-17215	1015-1612	2120-4125
B. vagra	90-110	5191-10623	806-1345	2075-3576
Crossocheilus latius	125-215	32615-66228	3512-6036	2420-4512
Garra gotyla gotyla	165-212	42615-75025	4115-7811	2612-4675
Labeo dero	230-340	204175-412180	17540-40210	52616-85182
Schizothorax richardsonii	190-560	69418-175150	7375-251150	1578-14316
Tor chilinoides	120-207	17590-83120	713-6533	952-3628
T. putitora	310-645	450000-3815000	38000-412000	9150-95815
T. tor	315-658	350000-4215000	35000-410000	8400-98882
Nocmacheilus beavani	76-105	1563-7567	90-748	98-1124
N. botia	81-103	4702-9144	732-1936	3004-4812
N. montanus	66-100	2329-8810	75-1850	130-1805
N. rupicola	56-100	1395-5125	44-835	65-1218
Glyptothorax brevipinnis alaknandi	66-102	2710-5700	65-812	20-585
G. garhwali	140-156	30150-46712	2298-10076	1025-3103
G. pectinopterus	71-110	4120-7120	487-899	205-814
Pseudecheneis sulcatus	114-163	11828-35135	492-1254	194-805
Mastacembelus armatus	262-329	56000-92350	7115-22150	1167-3025

(3) Some of the fertilized ova die due to sudden rise and fall in atmospheric and water temperatures. Sometimes, due to heavy rainfall the spawns from shallow spawning grounds are washed away by the turbulent current. Invariably, the shallow spawning grounds lose their link with the main stream and the fry die when water of the area becomes shallow and warm. The low survival rate of these fishes, is, therefore, due to a number of natural hazards. *Tor putitora* spawns in several situation during the breeding season. Throughout the year, the environmental conditions may not be favourable or conducive for the developing spawn. Due to sudden rise and fall of water temperature and heavy rainfall, the fertilised ova or even fry perish.

On the other hand, some of these fishes have low fecundity but high rate of survival. It may be due to selection of suitable spawning grounds, favourable breeding period, proper fertilization of eggs and favourable climatic factors such as rainfall, water temperature, atmospheric temperature, pH and turbidity etc.

RATE OF SURVIVAL

It has been observed in the present study that survival rate of juveniles of *Schizothorax richardsonii* is highest in these rivers and streams. The fecundity of this fish is also high. The high concentration of population of this species in the streams of this area is due to proper adaptation of the species to the environmental conditions of these streams and selection of suitable breeding grounds. The survival rate of *Tor chilinoides, Barilius bendelisis, B. vagra* and *Mastacembelus armatus* is also good according to their fecundity.

Noemacheilus beavani, N. botia, N. montanus, N. rupicola, Glyptothorax brevipinnis alaknandi, G. pectinopterus, G. garhwali, Pseudecheneis sulcatus lay eggs under stones and, therefore, the chances of getting these ova fertilised are rather remote when the male shed spermatic fluid over them. Sometimes the fertilised eggs get swept away with the torrential flood as is the case in majority of other hill-stream fishes. It has been observed that the fry and fingerlings of many of these species are carried away along with the irrigation water into nearby paddy fields where they die in large numbers when the water evaporates or is absorbed by soil. The fry of *Glyptothorax pectinopterus, G. brevipinnis alaknandi, Pseudecheneis sulcatus* and species of *Noemacheilus* suffer in large numbers in this manner.

Predatory fishes like *Mastacembelus armatus* are also responsible for the low survival rate of juveniles of many species because they feed on the eggs, fry and fingerlings of many fishes like *Noemacheilus* spp., *Barilius* spp. and *Schizothorax richardsonii*, etc.

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27. PISE DAM — AN ECOLOGICAL DISASTER FOR THE FRESHWATER PIPE-FISH *DORYICHTHYS CUNCALUS* (HAM.-BUCH.)

(*With a text-figure & a map*)

Among the fishes displayed at the Taraporevala Aquarium, Bombay, a popular exhibit used to be a freshwater pipe-fish, *Doryichthys cuncalus* (Hamilton-Buchanan), because of its unique shape and swimming habits, and the peculiar breeding behaviour where the male carries the eggs in a brood-pouch on its abdomen.